

Synchro Set-up Guidelines (Signalized Systems)

- ❑ Using the Add Link icon, draw a stick diagram of your intersection(s) orienting the roadway/intersections as close to north-south as feasible. Note that Synchro shows you the approximate distance and coordinate you are drawing at the bottom left hand corner of your screen.
- ❑ If there is an aerial photograph available, it may be imported into Synchro and the network may be placed over the aerial. This will help provide accurate spacing and angles between intersection. Under File at the top of the screen, highlight Graphics and click on Import Background. Select the file name and the aerial will be displayed in a new window. Select the base point on both the photo (select a major intersection in the photo) and the network (click on the center of the map area). To set up the scale you must know a distance between two points in the network. Under the 'Scale' section click in the box next to 'Feet' and entire this know distance. Next, select in the box next to 'Pixels' and select the beginning and end points for the know distance that you provided earlier. It is recommended to uncheck the 'Copy Bitmap file...' box. Click on 'Next' and the photo should be loaded onto the map window and the scale should be set. Test the scale by drawing a link according to your known distance and see if it is correct.
- ❑ Once the intersection is drawn, click on one of the links, right click on the mouse, click on properties and the link setting window will appear. Enter the roadway name and speed limit for this link in the window. You must do this for EACH link where there is a name and/or speed change. Note there is a distance for the link in the window. You can click on the 'Move Node' icon and adjust the nodes to get your links the proper distance.
- ❑ Under Options at the top of the screen open Network Settings and follow the steps below to set up your diagram. If you would like the changes to occur to all intersections in the network, press the SET ALL button after each input. Make sure your scope is set to 'Entire Network' so changes will be made for every intersection. If you have values that differ for certain approaches, you should changes these in the appropriate windows during the analysis. In general, do not change any of the default values except the ones below.
 1. Click on the Lanes tab
 - ❑ If right turns on red are not allowed or if you are analyzing a future intersection, uncheck the right turn on red box.
 - ❑ Set lost time to 5 seconds for most intersections, and increase clearance as needed for large cross-sections such as a single point urban interchange (SPUI). At the bottom of the palette, make sure the Entire Network box is checked under the Set All Scope.
 2. Click on the Volumes tab.
 - ❑ Change the Heavy Vehicle percentages and Speed Limit to whatever is appropriate for your project.
 - ❑ Double-check the peak hour factor (PHF) and make sure it is 0.90. If the PHF's have been calculated, enter them in the 'Volumes' window for each intersection.

3. Click on the Timings tab.

- ☐ Cycle Length-set the cycle length to a range that is appropriate for your phasing (see *Analysis Guidelines* for recommended minimum cycle lengths)*
- ☐ Check the allow Lead/lag Optimization box
- ☐ Set the yellow time to 5 seconds*
- ☐ Set the red time to 2 seconds*
- ☐ Minimum Split Thru-set to minimum initial green plus 5 secs yellow plus 2 secs all red. Minimum initial green times should be 10 seconds for 35 mph or less, 12 seconds for 36-45 mph, and 14 seconds for speeds over 46 mph.*
- ☐ Minimum Split Lefts and Side Streets-set to 14 secs (7 secs green plus 5 secs yellow plus 2 secs all red)*
- ☐ Controller type-set to actuated coordinated (recommended for multiple intersection review) or actuated uncoordinated*

* If field data is available, use in lieu of default values for existing intersection analyses.

4. Click on the Phasing tab

- ☐ Pedestrian Phase-Uncheck box
- ☐ When performing an analysis on existing conditions, the current timing parameters should be coded into Synchro in place of the values stated above. This is to provide a more accurate analysis of the current operations at the signal.
- ☐ Click on the node you want to code information for first. Right click on the mouse and click on quick editor to enter the number of lanes for each direction. You can also click on the Lanes icon at the top of the screen to enter this information.
- ☐ Click on the Lanes Window to enter a storage length for a particular lane. If you are in an area that does not have flat terrain such as the mountains, you can enter the percent grade if that information is available. Also, unless you are in an urban area, leave the area type as other (default). If you are in an urban area change the area type to CBD (Central Business District).
- ☐ Another way to enter the volumes by lane is by clicking on the Volume Inputs icon and entering the appropriate volume for each movement. If the percent heavy vehicle varies by direction, you can enter the directional percentages here.
- ☐ Click on the Timing Settings. If necessary, change any left turn movements from perm (permitted) to prot (protected) as determined by the left turn treatment formula (see *Analysis Guidelines* in the Access Management Group Training Manual). For existing intersections with a protected + permitted left-turn treatment, fix lead/lag optimization for a lead left-turn. This will prevent a “yellow trap” situation.

Note: Also, run the “Coding Error Check” in the Options menu to check for any accidental errors found in the coding.

- ☐ If you have a coordinated signal system, change your reference phase to match the directional flow of traffic that you want coordinated (usually 2+6). If you are running a

signalized system and can't determine which intersection is the controlling intersection, check that intersection for the master intersection.

- ❑ Click on Optimize and Network Cycle Lengths. Set up your minimum cycle length to whatever is appropriate for this system (refer to the minimum cycle length criteria table). For instance, if you have three intersections, 2-2 phase and 1-3 phase intersections, the minimum cycle length will be 90secs. Once your minimum cycle length is in the neighborhood of 120 plus/minus seconds, it is possible to check the half cycle length box so the 2 phase intersections could run at a 60 second cycle length or more, etc. Make sure extensive is shown for offset optimization. Then click on automatic.
- ❑ Click on Optimize at the top of your screen and then Network Offsets. Make sure that optimize, optimize lead/lag (the gauge should be in the middle) and entire network are marked and hit OK.
- ❑ At this point, you have probably gotten the best level of service you can get without making adding some additional lanes to your intersection(s). Any approaches or movements whose queue length displays a “#” or a “m” should be monitored for improvements given there may be serious delay and queuing problems for this approach or in the vicinity. These problems will need to be address in order for the intersection to operate properly.
- ❑ Under ‘Options’—‘Scenario Manager’ add appropriate information regarding the network being analyzed. This will distinguish each file from one another during print out of a report. This information will be useful for anyone looking at your files in the future.
- ❑ Under the file menu, select ‘Create Report’ to generate an analysis report. This can be done by zone, intersection, or for the entire network. The information entered in the Scenario Manager will be used for the headers and footers. Select which type of report you wish to print and preview the document to ensure the information displayed is appropriate. The ‘Intersection: Lanes, Volumes, and Timings’ report will output the necessary information for most analyses.

SimTraffic

- ❑ Once you have your Synchro file set up and saved, hit the SimTraffic animation button to simulate how your traffic will flow on your project. If you get a fatal error message, the simulation will not run and you will need to modify your Synchro file before the simulation will work. When running SimTraffic, you should always seed the network for 10 minutes and simulate the traffic for a one hour time period. Under Options go to Intervals and Volumes, adjust your start times and durations to reflect the appropriate time of day and duration for your simulation.
- ❑ Adjust storage lengths in Synchro to accommodate left and right-turn vehicles that are blocked by queues due to through vehicles. Compare queue lengths given by Synchro and SimTraffic to validate storage lengths. If there are discrepancies between the queue lengths provided, view the animation to determine storage need.

****** After running your simulation if you decide to make any lane configuration or other changes, you must go back to Synchro, make the changes and reoptimize, etc., your network. Be sure to make changes for all time periods analyzed.

- ❑ Once you have your system running properly, hit Record Simulation Icon so you don't have to continue to seed the network each time you want to watch the simulation.

Miscellaneous

You can model stop-controlled intersections on Synchro if you have traffic forecasts for the intersection. Enter your volumes as above, but go to the Phases tab and change the controller to unsignalized. Note that you cannot obtain a LOS for an unsignalized intersection from Synchro. You will have to run that intersection in another software program such as Sidra or Highway Capacity Software (HCS) to get a LOS for an unsignalized intersection.

Occasionally it is necessary to install “dummy” nodes in your simulation. If you have interchange loops or free flow right turn lanes or are working with a single point urban interchange (SPUI), you will probably need to install “dummy” nodes. In order to install “dummy” nodes, you will need to add a link, change the nodes to unsignalized at both ends of the link and change the movement to free flow, yield or stop-controlled (Synchro initially assumes all movements are stop-controlled). You will have to enter the directional volumes at each new node.

Lane drops can be modeled in synchro. Add a “dummy” node in the area of the lane drop/addition by deleting the link and leaving the node. Click on the link you want to add/drop the lane, hit properties and change the travel lanes to the appropriate number. Move the node and adjust the link distance as necessary.